

CLAIMS

We claim:

1 1. A system for sharing bandwidth among a plurality of internet service
2 providers (ISPs) coupled to a backbone network, the system comprising:
3 a broadband customer access network for coupling a plurality of end-users to
4 the backbone network, wherein each end-user is associated with a
5 particular one of the plurality of ISPs;
6 a first router coupled to the customer access network and in communication
7 with the network for source-routing data packets output by at least one
8 end-user to the ISP associated with the at least one end-user; and
9 a second router coupled to the backbone network and at least one of the
10 plurality of ISPs for receiving the data packets source-routed by the
11 first router and passing the data packets to the ISP associated with the
12 at least one end user.

1 2. The system of claim 1, wherein the first router is an aggregation router
2 coupled to the customer access network and the backbone network, the aggregation router
3 for aggregating data packets received from a plurality of end-user systems on the
4 customer access network onto the backbone network.

1 3. The system of claim 1, wherein the first router is the headend of a label
2 switched path and the second router is the tailend of the label switched path.

1 4. The system of claim 3, wherein the first router pushes a label onto each
2 data packet received from the at least one end-user and the second router pops a label off
3 each data packet, further comprising:
4 at least one intermediate node coupled to the network between the first and
5 second routers, the at least one intermediate node for receiving a data

6 packet from the first router, performing a label swap on the packet, and
7 routing the data packet towards the second router.

1 5. The system of claim 1, wherein the broadband customer access network is
2 a cable television network.

1 6. The system of claim 1, wherein the broadband customer access network is
2 a telephone network.

1 7. In a network having a headend and a tailend, a method of sharing
2 bandwidth on the network among one or more internet service providers (ISPs) coupled
3 to the tailend, the network receiving data packets from end-users coupled to the headend
4 and associated with particular ones of the one or more ISPs, the method comprising the
5 steps of:

6 creating a forwarding equivalency class (FEC) for each of the one or more
7 ISPs coupled to the tailend;
8 passing the label for each FEC to the headend;
9 storing a label for each FEC in an FEC table at the headend;
10 receiving, at the headend, a data packet from an end-user;
11 determining the ISP associated with the end-user; and
12 routing the data packet through the tailend to the ISP associated with the end-
13 user using the label stored in the FEC table for the FEC of the ISP.

1 8. The method of claim 7, wherein the network comprises an intermediate
2 node between the tailend and the headend and further comprising the steps of:

3 receiving, at the intermediate node, the label and FEC from the tailend;
4 building an intermediate FEC table at the intermediate node storing the label
5 and the FEC received from the tailend;
6 storing an upstream label for the FEC in the intermediate FEC table; and
7 passing the upstream label and the FEC from the intermediate node to the
8 headend.

1 9. The method of claim 7, wherein the determining step comprises the step
2 of:
3 determining an autonomous system number (ASN) of the ISP associated with
4 the end-user.

1 10. The method of claim 9, wherein the routing step comprises the step of:
2 looking up the ASN in the FEC table to determine the label.

1 11. The method of claim 7, wherein the step of storing the label for each FEC
2 in the FEC table comprises the step of:
3 verifying that a better path for the FEC does not exist.

1 12. The method of claim 11, wherein the step of storing the label for each FEC
2 in the FEC table further comprises the steps of:
3 arbitrating between similar FECs; and
4 arbitrating between similar labels.

1 13. The method of claim 11, wherein the step of storing the label for each FEC
2 in the FEC table further comprises the step of:
3 selecting among multiple paths associated with an FEC using a path-choosing
4 metric.

1 14. The method of claim 7, wherein the routing step comprises the step of:
2 pushing the label stored in the FEC table for the FEC for the ISP onto the data
3 packet.

1 15. The method of claim 7, further comprising the step of:
2 accounting for an amount of data passed to the ISP associated with the end-
3 user.

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Year	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100																			
Population	1,000,000	1,050,000	1,100,000	1,150,000	1,200,000	1,250,000	1,300,000	1,350,000	1,400,000	1,450,000	1,500,000	1,550,000	1,600,000	1,650,000	1,700,000	1,750,000	1,800,000	1,850,000	1,900,000	1,950,000	2,000,000	2,050,000	2,100,000	2,150,000	2,200,000	2,250,000	2,300,000	2,350,000	2,400,000	2,450,000	2,500,000	2,550,000	2,600,000	2,650,000	2,700,000	2,750,000	2,800,000	2,850,000	2,900,000	2,950,000	3,000,000	3,050,000	3,100,000	3,150,000	3,200,000	3,250,000	3,300,000	3,350,000	3,400,000	3,450,000	3,500,000	3,550,000	3,600,000	3,650,000	3,700,000	3,750,000	3,800,000	3,850,000	3,900,000	3,950,000	4,000,000	4,050,000	4,100,000	4,150,000	4,200,000	4,250,000	4,300,000	4,350,000	4,400,000	4,450,000	4,500,000	4,550,000	4,600,000	4,650,000	4,700,000	4,750,000	4,800,000	4,850,000	4,900,000	4,950,000	5,000,000	5,050,000	5,100,000	5,150,000	5,200,000	5,250,000	5,300,000	5,350,000	5,400,000	5,450,000	5,500,000	5,550,000	5,600,000	5,650,000	5,700,000	5,750,000	5,800,000	5,850,000	5,900,000	5,950,000	6,000,000	6,050,000	6,100,000	6,150,000	6,200,000	6,250,000	6,300,000	6,350,000	6,400,000	6,450,000	6,500,000	6,550,000	6,600,000	6,650,000	6,700,000	6,750,000	6,800,000	6,850,000	6,900,000	6,950,000	7,000,000	7,050,000	7,100,000	7,150,000	7,200,000	7,250,000	7,300,000	7,350,000	7,400,000	7,450,000	7,500,000	7,550,000	7,600,000	7,650,000	7,700,000	7,750,000	7,800,000	7,850,000	7,900,000	7,950,000	8,000,000	8,050,000	8,100,000	8,150,000	8,200,000	8,250,000	8,300,000	8,350,000	8,400,000	8,450,000	8,500,000	8,550,000	8,600,000	8,650,000	8,700,000	8,750,000	8,800,000	8,850,000	8,900,000	8,950,000	9,000,000	9,050,000	9,100,000	9,150,000	9,200,000	9,250,000	9,300,000	9,350,000	9,400,000	9,450,000